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Impact of Chronic Periodontitis on Pulp Sensibility Evaluated by Electric Pulp Tester

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Abstract: ***Introduction: Dental pulp and periodontium are closely related and the effect of pulp necrosis on periodontal tissues are documented. Chronic periodontitis as being a state of chronic irritation might lead to pulp degeneration. Electric pulp test can be used when occlusion of dentinal tubules is suspected to evaluate pulp status. Negative responses are highly likely indicate necrotic pulp. Methods and materials: 112 single-rooted teeth selected from 22 patients with chronic periodontitis who sought treatment at dental departments of RMS hospitals (King Hussein Medical Hospital and Prince Zaid Military Hospital) were tested. 10 male and 12 female patients with ages ranging from 30 to 70. Teeth were divided into two groups: group 1 alveolar bone loss without apical involvement (tooth apex not reached), and group 2 alveolar bone loss with apical involvement. Electric pulp tester (Digitest II, TECHNOMEDICS) (fig. 1) was used to assess pulpal status by direct stimulation of sensory fibers. Data was collected and analyzed. Results: (Table. 1) One hundred and twelve teeth that met the inclusion criteria were assessed in this study. Electric pulp tests showed a higher number of teeth with a negative pulp response for group 2 and a significantly higher number of teeth with a positive pulp response in group 1. Conclusion: within the limitations of this study it was concluded that pulp necrosis (negative response to electric pulp tester) due to periodontal disease did not occur unless the root apex is involved.***

Keywords: chronic periodontitis, pulp necrosis, electric pulp tester

1. Introduction

Dental pulp and periodontium are closely related and the effect of pulp necrosis on periodontal tissues are documented (1,2). Whereas the effect of periodontal disease on pulp needs further investigation. Pulp is irritated by chemical, mechanical, or thermal simulation of overlying dentin (3). That might be the case in chronic periodontitis as being a state of chronic irritation (4).

It is unlikely that degenerative pulp condition would improve, indicating an irreversible abnormality. In this case, pulp response can be influenced by electric stimulus. Therefore, to determine if dental pulp is vital and healthy is the most indicated approach for a differential diagnosis (5).

The electric pulp test measures the neural response to stimuli. Therefore, this test can be used when occlusion of dentinal tubules is suspected to evaluate pulp status. Negative responses are highly likely indicate necrotic pulp (6).It is important that clinicians know how to exactly apply and interpret electric pulp test results, because it might give false positive results due to its dependence on electric charge that might leak to surrounding tissues (7).

It is important to fully understand the relation between pulpal and periodontal disease in both directions. The aim of this study is to evaluate the impact of chronic periodontitis on pulp sensibility tested using electric pulp tester.

2. Literature Survey

Paul and Hutter in their study (1) concluded that advanced periodontal lesions may adversely affect endodontic health. Zuza et al. (4) studied the histopathological features of dental pulp in teeth with different levels of chronic periodontitis severity and stated that periodontitis can be considered a chronic and continuous stimulus on the pulp and pulp alterations was noted. Zuza et al. (11) studied the clinical influence of chronic periodontal disease on pulp sensitivity response and suggested that progression of periodontitis may significantly influence the negative pulpal sensitivity. Langeland and his colleagues in their study (12) despite observing pathological alterations in the pulp tissue, concluded that it did not surrender if circulation via the main canal was not affected. Mazur and Massler (13) studied the Influence of periodontal disease on the dental pulp while Jansson and his colleagues (15) studied the influence of endodontic infection on progression of marginal bone loss in periodontitis.

3. Materials and methods

This study was approved by the ethical approval committee of Jordanian Royal Medical Services (JRMS, Hashemite Kingdom of Jordan). Informed consent was obtained for study purposes, and privacy rights were preserved. 112 single-rooted teeth selected from 22 patients with chronic periodontitis who sought treatment at dental departments of RMS hospitals (King Hussein Medical Hospital and Prince

Zaid Military Hospital) were tested. 10 male and 12 female patients with ages ranging from 30 to 70. Inclusion criterion was single rooted teeth. Exclusion criteria were: Patients with pacemakers and cardiac monitoring devices, Patients who had received periodontal treatment in the previous 6 months, multirooted, carious, or restored teeth. Periodontal examination was performed by a periodontist and pulp sensitivity test (electric pulp tester EPT) was performed by an endodontist.

Periapical radiographs using the paralleling technique was used to assess alveolar bone loss. Teeth were divided into two groups: group 1: alveolar bone loss without apical involvement (tooth apex not reached) (n=96), and group 2: alveolar bone loss with apical involvement (n=16).

Electric pulp tester (Digitest II, TECHNOMEDICS) (Fig. 1) was used to assess pulpal status by direct stimulation of sensory fibers which has been shown to effectively evaluate pulp sensibility. Digital counter indicates the level of stimuli. Proper isolation was performed to prevent leak of electrical charge into periodontal fibers which would trigger a false positive response that could influence the research results (8), patients were asked to raise their hands when a tingling sensation is felt. The electric test was performed at the central point of the cervical third of the anatomic crown (8) using toothpaste as an electric conductor on the dental surface. Electric tests were repeated on contralateral healthy teeth.

Figure 1

4. Results

One hundred and twelve teeth that met the inclusion criteria were assessed in this study (Table.1). 82 teeth showed a positive response to electric pulp tester (i.e. vital) 78 of them belong to group 1 (chronic periodontitis without reaching the root apex, n=96, 81%) which statistically significant ($p < 0.05$). 30 teeth showed negative response to electric pulp tester (i.e. not vital) 12 of them belong to group 2 (chronic periodontitis reaching the root apex, n=16, 75%) which also statistically significant ($p > 0.05$). Which means that electric pulp tests showed a higher number of teeth with a negative pulp response for group 2 and a significantly higher number of teeth with a positive pulp response in group 1.

Table 1	No. of teeth with positive response	No. of teeth with negative response
Group 1	78*	18
Group 2	4	12*

*Statistically significant difference (c2 = 14.1379; Degree of freedom = 2; P = .0009; c2 adjusted residual, a = 0.01)

5. Discussion

The results in this study show a clinical correlation between pulp response and status of periodontal disease and in agreement with previous studies (4, 10, 11). Moreover, on a histologic level alteration in the pulp do exist in the presence of periodontal disease (4, 10–12).

This study shows that dental pulp remains vital until the root apex is reached periodontally, in teeth were apex was not reached (group 1 (n=96)) there was no prevalence of a negative pulp response, on the other hand, significant negative pulp responses were observed in teeth with apical involvement (group 2 (n=16)). Clinical results of this study reinforce those from another study (12). These authors, despite observing pathological alterations in the pulp tissue, concluded that it did not surrender as long as circulation via the main canal was unaffected which is also confirmed in the clinical part of the same study (12) in which the authors reported that a more severe progression of periodontitis was significantly related to a negative pulp response.

Single-rooted teeth with periapical radiolucent lesions were significantly correlated to deep periodontal pockets and worse radiographic bone loss (14, 15). The results of our study suggest that pulp status is affected by the severity of active periodontal disease and progressive bone resorption.

Chronic periodontitis led to histopathological changes in the radicular pulp of involved teeth (4). However, the coronal pulp remained within the normal range in all stages of periodontitis (4), showing a great defense capability of pulpal tissue.

Dental pulp usually reacts to injury by calcification in pulp chamber and narrowing of root canals (13). The periodontium is affected by pulp necrosis products, showing inflammation and resorption. Which shows a mutual relation between pulp and periodontal tissue.

6. Conclusion

Further investigation is needed to fully evaluate the effect of various levels and stages of chronic periodontitis before the disease reaches the root apex. This study concluded, in agreement with previous studies, that negative pulp response to electric pulp tester interpreted as pulp necrosis didn't occur until periodontal disease reaches the root apex (main blood supply).

7. Future Scope

Implementation of new techniques in diagnosis and therapy of periodontally involved teeth may save teeth planned for extraction. Development of a more detailed classification of periodontal disease from an endodontic point of view is needed for better diagnosis and therapy.

8. Acknowledgments

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